(nucleus, chloroplasts, mitochondria) and the relative areas of each organelle estimated from point counts[16].

Results. The data were analysed using χ^2 tests, where the expected number of grains over an organelle was
$E(n_i) = A_i/A_i + A_j \cdot N$
where A_i was the area of the first organelle, A_j was the area of the second organelle, and N was the total number of grains over the 2 organelles.

The hypothesis being tested was that the amount of label over the organelles was expected to be proportional to their relative areas. Because expectations in classes for individual cells were frequently less than 5, probabilities (from the information statistic) of the amount of label over the organelle compared with the remainder of the cell were calculated for each cell. Those organelles which had significant probabilities are indicated in the Table.

Examination of the data (see Table) indicated that there was little difference between the expected number of grains and the actual number of grains over the nucleus and mitochondria; the values for the mitochondria being significantly less than the expected. The organelles were compared with the remainder of the cell when values for nucleus chloroplasts and mitochondria had been extracted. The cell wall was too thin to be resolved autoradiographically and was included in the values for the 'remainder' of the cell. The number of grains over the chloroplasts was in most cases, greater than the expected number of grains. Apart from 2 nuclei, the only significant increase in concentration of Zn^{65} occurred in the chloroplasts.

Discussion. Zinc-65 autoradiographs of *Eutreptia* sp. indicated that zinc was accumulated by these single-celled algae and localized in the chloroplasts. The *Eutrepia* sp. used in this experiment were obtained from a high zinc environment and the nature of the accumulation of zinc in the chloroplasts cannot be established on the basis of these results alone. It is tempting to link the high levels of zinc-65 in the chloroplasts with the role of carbonic anhydrase, which contains 0.33% zinc[17], and which occurs predominantly in the chloroplasts.

Eutreptia sp. occurs at the bottom of the food chain, therefore its ability to accumulate and possiblyincorporate zinc at high levels is of major importance since zinc belongs to the group of heavy metals which are poisonous to most organisms when occurring in excessive quantities.

Résumé. On a montré par les techniques de microscopie électronique et de l'autoradiographie que le zinc-65 s'accumule dans les chloroplastes de l'*Eutreptia* sp.

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Boron Tolerance and Enhancement of Boron Toxicity by Chloride Ions in Alkali Sacaton during Germination of *Sporobolus airoides* Torr.

Alkali sacaton (*Sporobolus airoides* Torr.) is an important forage grass of southwestern United States. In an effort to introduce it in Pakistan, preliminary studies on its salt tolerance and cation interaction have already been reported[1]. Since soil salinity and boron toxicity are closely associated, the present work was undertaken to determine the boron tolerance and the interaction of boron with other ions of growth medium during germination of this grass.

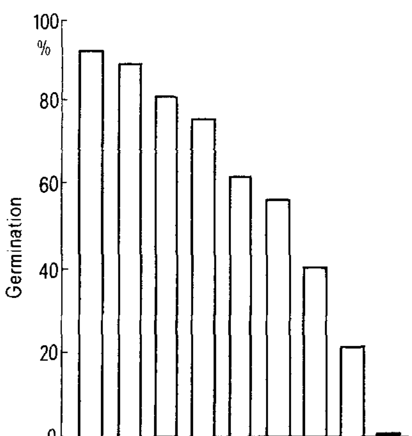

Fig. 1. Boron level in the culture solution. a, Control; b, boron-level 100 ppm; c, 200 ppm; d, 300 ppm, c; 400 ppm; f, 500 ppm; g, 600 ppm; h, 700 ppm; i, 800.

Germination tests were performed during summer season at room temperature in plastic dishes containing 200 ml nutrient solutions. Healthy seeds were selected and sterilized with 0.1% $HgCl_2$ for 1 min. These seeds were soaked for 18 h in deionized water prior to imposing treatments. 50 seeds were placed on nylon mesh and suspended over the nutrient solution in each plastic dish. The nutrient solution used was 1/8 dilution of Hoagland solution. Boron was added in the forms of boric acid in the desired concentrations. All the solutions were prepared with deionized water. Counting of the germinated seeds was made every second day from the start of the experiment to 12th day when the experiment was concluded. Germinated seeds were discarded after counting. Germination in 1/8 Hoagland solution served as control. Treatments were replicated 4 times.

1. *Boron tolerance.* Boron level in the culture solution ranged from 100 ppm to 800 ppm. Figure 1 shows that percentage of germination decreased as the level of boron in the solution increased. Reduction in germination became more pronounced beyond 500 ppm boron and the seeds virtually stopped germination at the highest concentration of boron used.

2. *Effect of various salts on boron toxicity.* In studying the interaction of various salt with boron, its concentration in the nutrient medium was maintained at 100 ppm. At this concentration of boron NaCl, KCl, $CaCl_2$ and $MgCl_2$ at 5 mEq/l were added separately to observe their effect on

[1] S. Z. Hyder and S. Yasmin, J. Range Mgmt *25*, 390 (1972).

boron toxicity. It was noted that boron toxicity on seed germination was not reduced by addition of any salt. This toxicity, on the other hand, increased in the presence of all the salts added to the germination medium.

3. *Comparison between effect of chloride and other anions on boron toxicity.* In the experiment described above, all the salts containing chloride as anions interacted with boron and increased its toxicity. Interaction of boron with other individual ions such as CO_3, HCO_3,PO_4, SO_4 and NO_3 was also studied and compared with chloride ions. These anions and chloride ions were added as sodium salts at 5 mEq/l in the nutrient medium containing 100 ppm boron. It was observed that the various anions other than chloride did not interact with boron in increasing its toxicity. This effect was peculiar to chloride ions alone.

4. *Effect of various concentrations of chloride on boron toxicity.* In order to establish the lowest effective concentration of chloride in enhancing boron toxicity, NaCl at 200, 400, 600, 800 and 1000 µEq/l was added to nutrient solution containing 100 ppm boron, Figure 2 shows that chloride ions even at 200 µEq/l were effective in enhancing boron toxicity and these effects became more pronounced at increasing chloride concentrations.

Alkali sacaton showed a high degree of boron tolerance during germination. These results are in agreement with the work reported on wheat[2] and *Atriplex polycarpa*[3]. Although it has been reported that boron uptake in plant tissues is reduced in the presence of calcium[4,5], information relating to interaction of boron with other ions of the growth medium is strikingly lacking, particularly at germination stage. Since boron is usually absorbed as borate or tetraborate, it is likely that anions of the growth medium will interact with boron in the absorption process. In the present study, only chloride ions, even at a very low concentration (Figure 2), have been found to interact and enhance the toxicity of boron. The mechanism of such behaviour of chloride on boron cannot be explained on the basis of present data.

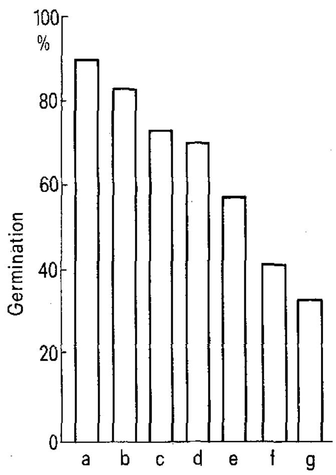

Fig. 2. Effect of various concentrations of chloride on boron toxicity. a, Control; b, boron 100 ppm; c, 200; d, 400; e, 600; f, 800; g, 1000 NaCl (µEq/l) + boron 100 ppm.

Zusammenfassung. Die Boron-Toleranz und ihre Interaktion mit anderen Ionen des Wachstummilieus in Alkali sacaton wurde während der Keimung untersucht. Die Keimung konnte bei einer Boron-Konzentration bis zu 500 ppm nicht beeinflusst werden. Nur Chlorid-Ionen förderten die Toxizität des Borons.

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[6] The research reported was financed in part by a grant made by the United States Department of Agriculture.

Panorpa communis L. und *Panorpa vulgaris* Imhoff und Labram, zwei Arten

Seit 125 Jahren dauert die Diskussion um die beiden Arten *Panorpa communis* L. und *Panorpa vulgaris* Imhoff und Labram an. Nachdem LINNÉ[1] *P. communis* beschrieben hat, haben IMHOFF and LABRAM[2] eine im Flügelmuster von der Nominatform unterschiedene «Morphe» als *P. vulgaris* eingeführt. MACLACHLAN[3] vermutet, dass eine von ihm als «Variation» *diffinis* beschriebene Form mit der Art *P. vulgaris* identisch sein könnte. ESBEN-PETERSEN[4] fasst *P. communis* und *P. vulgaris* als zwei «Formen» derselben Art auf, während FARBOTKO[5] aufgrund von Untersuchungen der Genitalarmaturen eine Trennung in zwei Arten für berechtigt hält. TJEDER[6] und MARTYNOVA[7] folgen der Auffassung von IMHOFF und LABRAM sowie FARBOTKO nicht und weisen darauf hin, dass die Variation der Strukturen des männlichen Genitalsegments eine Trennung der beiden «Morphen» in zwei Arten nicht rechtfertigt. LAUTERBACH[8] vertritt die Ansicht, dass es sich bei den beiden «Morphen» um ökologische Rassen handeln müsse. Alle genannten Autoren orientieren sich am morphologischen Artbegriff. Allenfalls LAUTERBACH nähert sich mit seiner Vorstellung einer evolutionsbiologischen Betrachtungsweise, unterliegt aber dem Trugschluss, dass ökologische Rassen von geographischen Rassen zu trennen seien, d. h. keine wohldefinierten geographischen Areale besitzen und somit sympatrisch vorkommen können. Es gibt aber «keinen Gegensatz zwischen geographischer und ökologischer Rasse (oder Ökotypus), da keine einzige geographische Rasse bekannt ist, die nicht auch eine ökologische wäre; noch gibt es eine ökologische, die nicht gleichzeitig eine mikrogeographische Rasse wäre»[9]. Die geographische Variation ist Ausdruck des jeweiligen ortsspezifischen Selektionsdrucks auf lokale Populationen.

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